Mühlbauer
High Tech International

MB PALAMAX®

TOTAL PROCESS TRANSPARENCY



CONTENTS

MÜHLBAUER GROUP AT A GLANCE 4

MANUFACTURING EXECUTION SYSTEMS 6

MB PALAMAX® 8

MÜHLBAUER'S SMART FACTORIES 9

MB PALAMAX® FEATURES 10

PALAMAX.MONITOR 11

PALAMAX.FACTORY-OVERVIEW 12

PALAMAX.STATS 13

PALAMAX.REPORT 14

PALAMAX.REMOTE 15

PALAMAX.TRACK&TRACE 17

PALAMAX.RECIPE 18

OPTIONS & OUTLOOK 19

MÜHLBAUER GROUP AT A GLANCE

MÜHLBAUER'S BUSINESS UNITS AND SITES

Founded in 1981 in the heart of Bavaria, the Mühlbauer Group has ever since grown to a leading global player in the fields of Parts & Systems, Semiconductor Related Products, Document Solutions & Equipment for Security Systems, and innovative Technologies for Electromobility and Flexible Solar Solutions. With around 4,000 employees, technology centers in Germany, Malaysia, Slovakia, the U.S. and Serbia, and 35 sales and service locations worldwide, Mühlbauer created a strong competence network around the globe.
Our global corporation continuously invests in the most modern innovations and creative ideas in order to enhance our competences and to provide you with optimized solutions. We aim to protect the environment with our advanced technologies and make life easier for countless people.

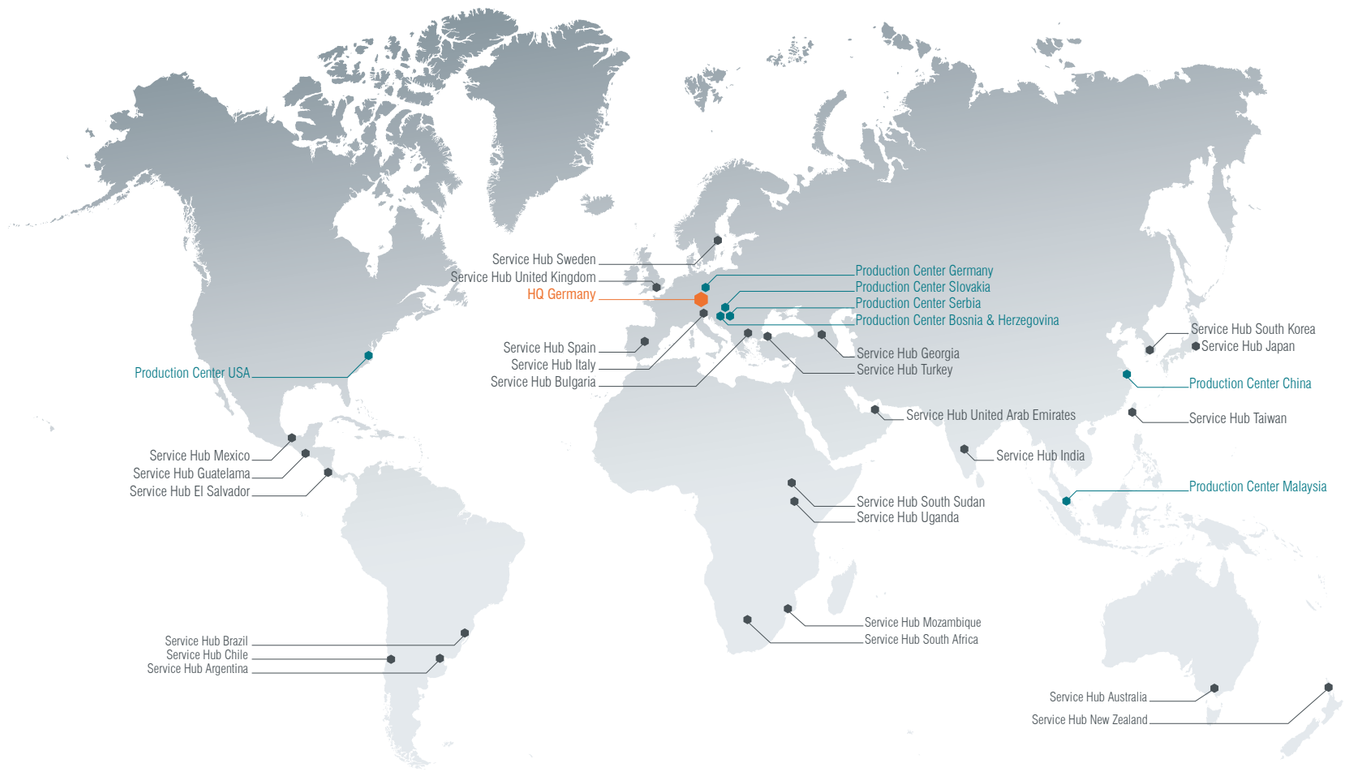
Our in-house precision part production **MPS** – Muehlbauer Parts & Systems – guarantees unlimited flexibility and highest customer satisfaction.

Our business unit **AUTOMATION** does not only develop and assemble individually customized production systems, but also offers intelligent software solutions for production automation (Industry 4.0). Vision inspection technologies as well as semiconductor and RFID applications complete our comprehensive portfolio.

Our youngest and currently most dynamic division **ATECH** – **Advanced Energy Technologies** – brings unique machinery requirements to series production. For the eMobility industry, we have been offering highly efficient production lines for the manufacture of pouch- and prismatic cells for lithium-ion batteries, as well as MEA's & stacks for fuel cells since 2022. Another promising area in this business field is our expertise in precise reel to reel material handling, which enables us to provide innovative production concepts for flexible solar cells and panels.

Our business unit **TECURITY®** is established as a competent partner for the implementation of security systems for identifying and verifying both documents and individuals. Our clients benefit from more than three decades experiential value which we have gained during the realization of over 300 ID projects worldwide.

There is no "can't do" at Muehlbauer. We tailor your solution!



Mühlbauer Bosnia & Herzegovina

Mühlbauer China

Mühlbauer Germany

Mühlbauer Malaysia

Mühlbauer Serbia

Mühlbauer Slovakia

Mühlbauer USA



MPS
Precision Parts & Surface Engineering



AUTOMATION
Production Equipment & Systems



MB ATECH
Battery & Fuel Cell Technologies



WORLD OF TECURITY®
Government & Technology Solutions

MANUFACTURING EXECUTION SYSTEMS

MB MCES
PERSONALIZATION MANAGEMENT SYSTEM

MB MCES is a personalization management software, which integrates incoming data with product definitions and controls the associated physical and electrical personalization processes. MB MCES handles personalization data from a variety of different input methods and formats.

MB INCAPE
INTEGRATED PRODUCTION MANAGEMENT SOFTWARE

MB INCAPE is Mühlbauer's Production Management Software for the production and personalization of electronic cards and documents (e.g. ID cards, ePassports, Driver's Licenses, EMV or GSM cards). Combining data management, production control and material management, the system allows for highly automated processes. It processes customer- and application-specific production, personalization, quality control and document delivery scenarios with highest solution flexibility.

MB PALAMAX®
TOTAL PROCESS TRANSPARENCY

MB PALAMAX®, Mühlbauer's Smart Factory solution, supports various applications from ID and document production over personalization to semiconductor backend and eMobility shop floors. It helps to monitor production data and makes it available for later processing, visualization and statistical analysis. This helps to uncover and realize efficiency boosts in your production system.

MB TOOL LEADER
CONNECTOR BETWEEN SYSTEMS

MB TOOL LEADER is a software package which consists of several applications and serves as a reliable link between the individual systems involved in the production process. By means of MB TOOL LEADER, the entire process chain – from the incoming order to the final precision part – can easily be monitored and controlled. This real-time machine monitoring guarantees an automated production process. Production errors can be detected and solved at an early stage. Thus, MB TOOL LEADER reduces the machine downtimes, which in turn leads to an increase of the machine's productivity by up to 20 percent.

MB EXPERT SYSTEM
RESOURCE PLANNING

MB Expert system is specialized tool developed for planning, scheduling and optimization production within production floor. This resource planning software system helps organizations automate and manage core business processes for optimal performance taking into account production's articles, orders and human resources.

FEATURES & ADVANTAGES

- Configurable workflow steps regarding personalization, quality assurance & issuance
- Seamless connection to MB PALAMAX® & MB DATA PREPARATION
- Fully-automated processing & production management
- Simplified administration due to web-based operator clients
- Scalability regarding different documents, machines & personalization locations
- Monitoring of real-time performance of the production
- Flawless integration of Mühlbauer's material management system (MB INCAPE WAREHOUSE)
- Seamless tracking of documents from point of production to issuance
- Connection to card / document management systems via web service, database, file-based interface
- Statistical tool analyze collected data & deliver customized statistics on OEE
- Standard interface to personalization machines with integration of third-party machines possible
- Tool which enables the remote operation of machines on the shop floor from a control centre
- Integration of MB USER MANAGEMENT
- Tool which increases effectiveness & efficiency so that production becomes more profitable
- Full coverage of production control requirements (security industry & EMV standards)
- Enables production engineering to prepare & test a repeatable factory set-up. Factories can switch between products within minutes.

MB PALAMAX®
TOTAL PROCESS TRANSPARENCY

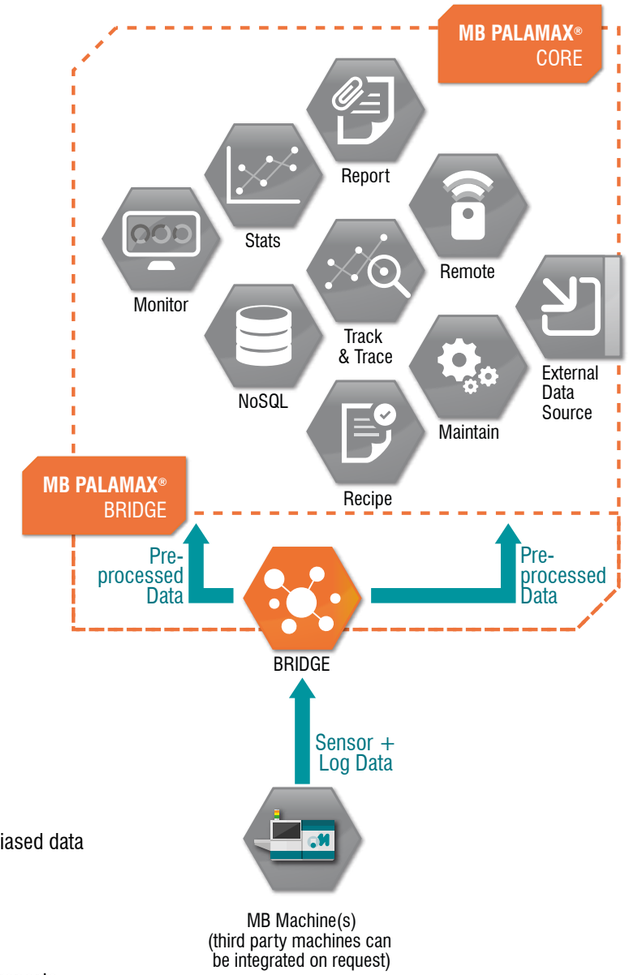
SMART FACTORY
INDUSTRY 4.0 ENABLED

MÜHLBAUER'S SMART FACTORIES FOR PRODUCTION ENVIRONMENTS FROM RFID PRODUCTS OVER ID TECHNOLOGIES TO ENERGY SOLUTIONS

MB PALAMAX®, Mühlbauer's Smart Factory solution, supports various applications from ID and document production over personalization to semiconductor backend and eMobility shop floors. Utilizing a NOSQL database, it is designed to continuously collect, process and analyze process data. This helps to monitor and improve your production. The collected process data is stored in batches for later processing, visualization and statistical analysis.

Mühlbauer's PALAMAX® Smart Factory software provides a highly-efficient interface for managers, supervisors, process engineers, maintenance technicians and operators who are tasked with process monitoring and the statistical analysis of the production process. Furthermore, MB PALAMAX® reliably supports the optimization of production planning and the improvement of controlling.





MAIN BENEFITS AT A GLANCE

- Automatic, accurate & unbiased data collection
- Monitoring of live performance
- Real-time analysis of important KPIs (incl. yield, performance, availability and OEE)
- Continuous visualization which allows for faster reaction
- Historical data analysis
- Visualization of all valuable machine data in real-time with interactive charts, graphs & more from any web-enabled device or PC
- Generation of informative reports
- More effective & cost-saving production
- Integration of MB and third-party equipment (on request)

SUMMARY

- Better data: automatic collection of accurate and unbiased data
- Monitoring of live performance
- Analyzing OEE data in real time
- Continuous visualization allowing fast reaction
- Historical data analysis
- Active system supporting you with notifications and reports
- Easy to configure, easy to use, easy to leverage
- Available on any web-enabled device
- Integration of MB and 3rd party equipment (on demand)
- Run more units, save rejects and money!

MB PALAMAX® FEATURES

To communicate with users, MB PALAMAX® utilizes a responsive web design to provide its interface. In this way, no expensive application software has to be installed on the individual device. Furthermore, all kinds of common web-enabled devices – from standard PC browsers, to tablets and even smart phones – can be used to communicate with the server system via a secure connection.



INSTANT VISIBILITY

- All relevant real-time KPIs at a glance:
  - » Overall Equipment Effectiveness (OEE)
  - » Yield
  - » Performance
  - » Availability
- Real-time visualization of all relevant machine data from any web-enabled device or PC
- Generation of informative reports
- Provision of insights to improve operations (on the line manager side) and make better fact-based decisions (on the management side)

MB PALAMAX® BRIDGE

- Universal data collector, handler and transformer
- Unlocks access to your machines
- Natively integrates with MB machines
- Integration of 3rd party machines on demand

RETURN ON INVESTMENT

- Spot trends & identify opportunities for improvement due to real-time monitoring
- Immediate intervention to avoid major defects
- Improved security standards
- Production with optimally employed staff

SECURITY & COMPLIANCE

- Total control of production data
- Safe storage of all data on customer's private servers or in the cloud
- Compliance with ISO & PCI standards

ACCESSIBILITY

- Responsive web design
- No expensive installation of application software on the individual devices
- Accessibility from any web-enabled device

MB PALAMAX MONITOR

TOTAL PROCESS TRANSPARENCY

The PALAMAX.Monitor module allows for a real-time monitoring of the production status, a number of key metrics, as well as further production-relevant messages. All information is collected from the entire shop floor.



Snapshot of the current system status, which is displayed on the monitoring module.

The main goal of "Real Time Monitoring" (RTM) is to make all real-time production data visible to users, so they can react fast and efficiently whenever production optimization is required.



Real-time calculation of KPIs

Errors can be detected in real time and fixed immediately.

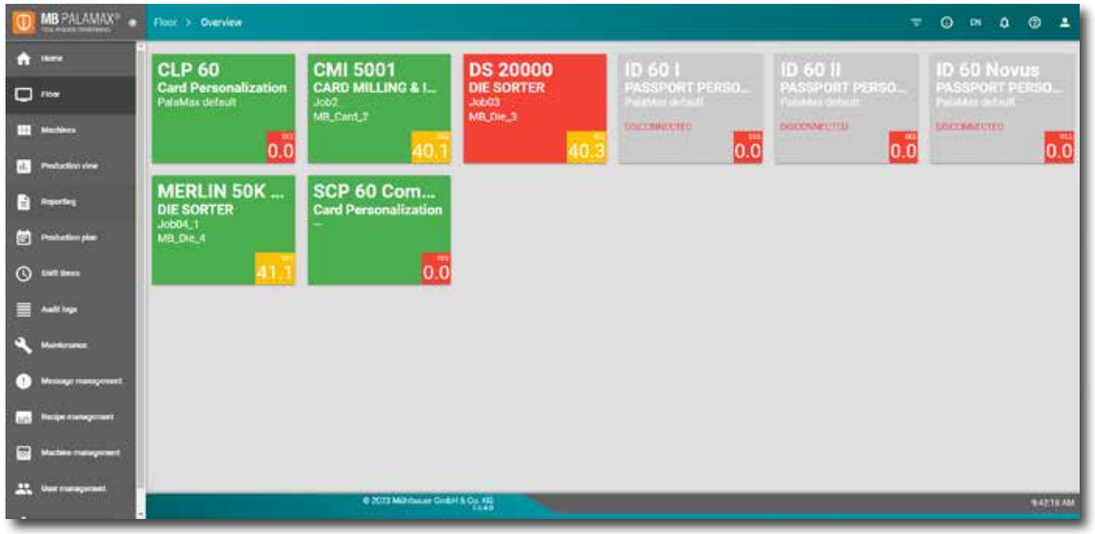
VISUALIZATION OF REAL-TIME PRODUCTION DATA

- Real-time monitoring of KPIs
  - » OEE (Overall Equipment Effectiveness)
  - » Yield
  - » Performance
  - » Availability
- UPH (Units Per Hour)
- MTBF (Mean Time Between Failures)
- MTBA (Mean Time Between Assists)
- MTTA (Mean Time To Assists)
- MTTR (Mean Time To Repair)
- Compact overview of all machine states:
  - » Running/Stop/Idle/Error/Service/Off
- Time in current state
- Operator
- Material (active product, recipe)
- Lot, lot size & percentage of completeness
- Counters, total parts (output) & good parts
- Failures, alarms & idle reasons

MB PALAMAX FACTORY OVERVIEW

COMPLETE PRODUCTION OVERVIEW

This module provides a complete production overview for a monitored shop floor. The display of this page follows a simple tile design: A tile's background color represents the general status of a machine. The text fields within the tile contain the machine's most important metrics and meta-data. Thus, everyone involved in the production process can retrieve the system's current status.



- Key Performance Indicators (KPI) such as:
  - » OEE (Overall Equipment Effectiveness)
  - » Yield
  - » Performance
  - » Availability
- Status display on large TV screens & monitors in production or office area
- Immediate positive effect on productivity
- Improvement of communication between departments

MB PALAMAX STATS

TOTAL PROCESS TRANSPARENCY

This module provides a reliable interface for management and system operators to monitor and visualize the production process more efficiently. PALAMAX.Stats displays different statistics of the available process data which are collected and stored in the database. The time intervals can be selected freely.



The Machine Timeline completely tracks machine states, operators, lots & recipes.

The Unit Counter displays the good and bad units produced, as well as the error distribution across the different stations.

The error report immediately displays the TOP 5 errors.

DISPLAYING TRENDS FOR KEY STATISTICS FOR SINGLE MACHINES & GROUPS OF MACHINES

- Selection of different time frames day, weeks, shift, lot times, custom range
- Reporting of historical data:
  - » State, Product & Recipe
  - » UPH & Utilization
  - » Yield, total parts (output)
  - » Good parts, rejects
  - » Uptime & Downtime
- Detailed analysis of processes such as
  - » Yield loss by root cause
  - » Identification of bottlenecks

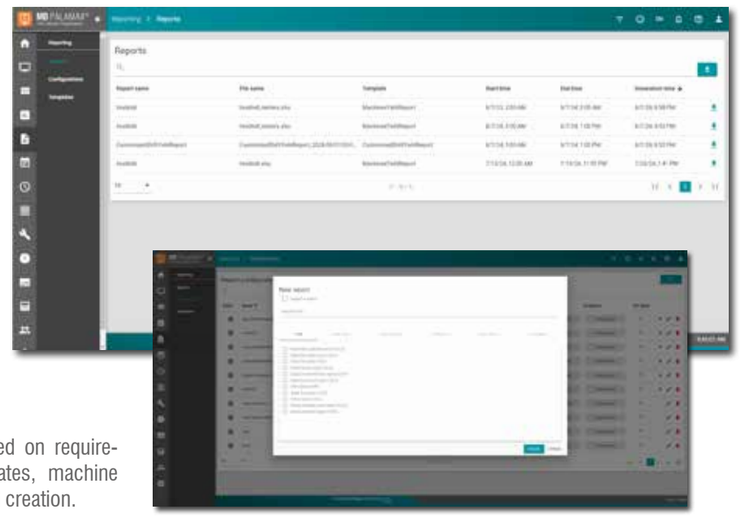
MB PALAMAX REPORT

TOTAL PROCESS TRANSPARENCY

This module tracks and documents the productivity. The automated data collection delivers accurate reports. Manual data entries are not necessary, anymore. The reporting module generates Microsoft Excel, CSV, XML and/or PDF files containing all relevant data. It is fully customizable and provides the possibility to use one of Mühlbauer's various standard report templates or create an individual report template which can be uploaded to the system.

DISPLAYING OF UPDATES BY MEANS OF AUTOMATIC GENERATED REPORTS & NOTIFICATIONS

- Tailor-made reporting to display individual requirements
- Creation of custom reports
- Creation & upload of customized Microsoft Excel templates
- Configuration of MB PALAMAX® with individual schedules, notifications, alerts & recipients lists



Reports are automatically distributed and forwarded by mail. They also stay available for later downloading.

Creation of reports based on requirements: individual templates, machine selection, defined time of creation.

PALAMAX.REPORT PROVIDES THE FOLLOWING FUNCTIONS

- Flawless & accurate reporting
- Report generation based on:
  time (day, week or month) of production, production week, production month, lot, carrier
- Machine list (single machine or machine group)
- Machine state analysis
- KPI Analysis
  - » OEE
  - » Yield
  - » Performance
  - » Availability

GENERATION OF LOT REPORTS CONTAINING

- Production Meta Data as
  - » Operators
  - » Lot & recipe information
  - » Times: start time, end time & duration
  - » Machine serial number & machine name
- Process station results: performance data, number of good and rejected units, yield calculation for each process module
- Used Material: input material, output material & total numbers

MB PALAMAX REMOTE

TOTAL PROCESS TRANSPARENCY

Thanks to MB PALAMAX.Overview, you are aware of the exact status of your machines on the shop floor. With MB PALAMAX.Remote feature, you can also control your machines. See what your operators see to help them solve an issue or control any machine from your control center. This unique feature, therefore, reduces staff requirements on the shop floor and saves time when resolving issues.

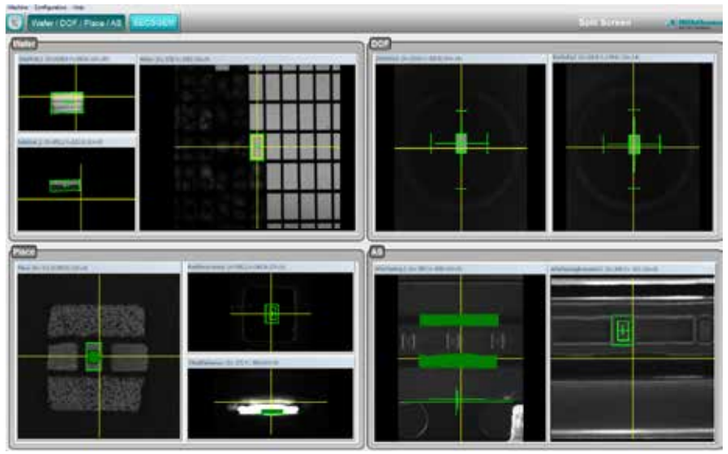
Remote feature offers two valuable functions:
Machine control and **Vision**





The machine control function allows you to remotely access the machine functions as if you were directly standing in front of the control panel. Different types of security measures can be applied as well as various types of access limitations – this means that only selected users have rights to see the Machine remote control and/or use it.

The Vision function brings a camera's view on the screen helping to check the correct location of a product and also check the quality. (Only available on machines with Vision Inspection.)

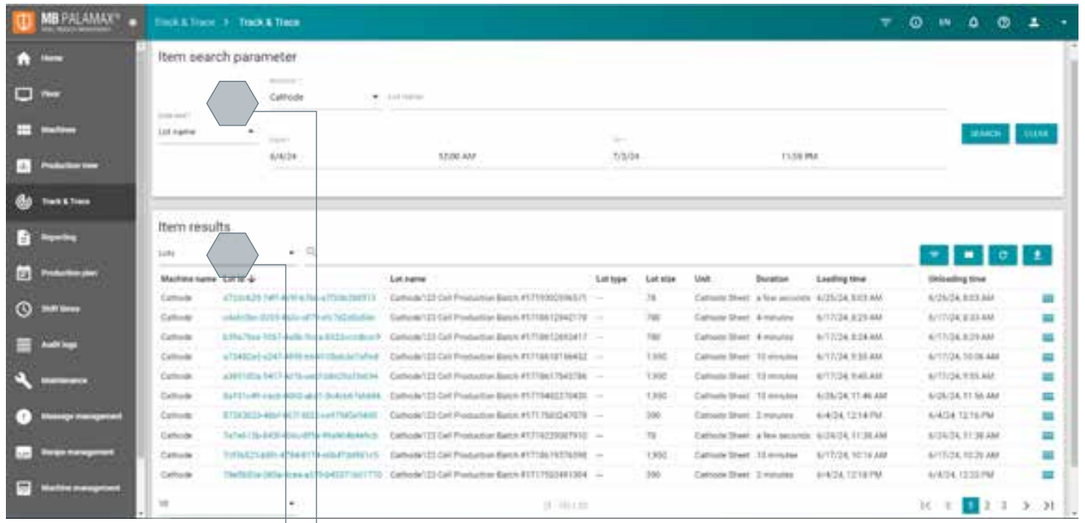


- Direct access to all machines from one central place – you can see and do everything, just as if you stood directly in front of a machine control panel
- Allows significant time savings of valuable employees
- Improves staff effectiveness and security
- Possibility to limit accessing Remote feature to selected users or limit the feature only to "view mode" without possibility to affect anything

MB PALAMAX TRACK&TRACE

TOTAL PROCESS TRANSPARENCY

The PALAMAX.Track&Trace module allows tracing of a product throughout its production cycle by processing the associated data flows and creating a logical and chronological connection between them. It helps support sustainability, accountability and compliance goals by creating a transparent history of the inputs and production conditions of each produced unit.



Search parameters allow users to search for process steps based on Lot name/id and physical/logical Item ID.

Item results display process steps corresponding to the search parameters with ability for a more detailed search based on lots, items, measurements and more.

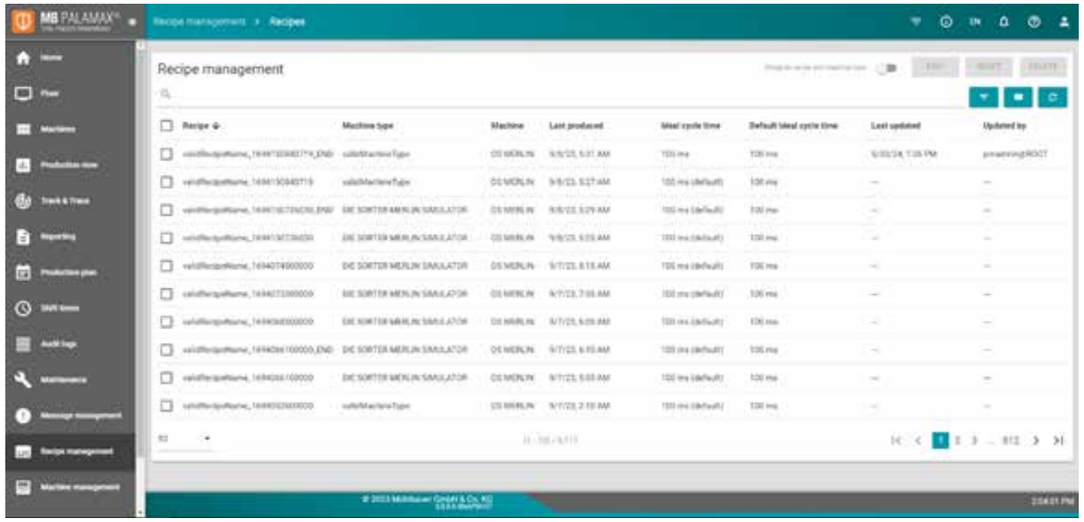
PALAMAX.TRACK&TRACE PROVIDES

- Tracing of a product throughout its production cycle
- Creation of logical and chronological connection between production data flows
- Helping to support sustainability, accountability and compliance goals
- Association of materials and process conditions with individual units
- Easier identification of improvement opportunities

MB PALAMAX RECIPE

TOTAL PROCESS TRANSPARENCY

PALAMAX.Recipe manages recipes and their versions. This enables production engineering to prepare and test a repeatable factory set up: Factories can switch between products within a matter of minutes. It can set up production and verification systems in a repeatable manner, providing comparable quality performance indicators.



A simple interface allows for easy management of the available recipes.

PALAMAX.RECIPE PROVIDES

- Manages recipes' ideal cycle times and their versions
- Factories can switch between products within a matter of minutes
- Enables production engineering to prepare and test a repeatable factory set up with comparable performance indicators
- Makes production more comprehensible and specific

OPTIONS & OUTLOOK

MB PALAMAX® is delivered with the core modules Monitor, Factory-Overview, Stats and Report. The feature modules Remote, Maintain, Track&Trace, Audit, Cloud and Self-monitoring are available on request, as well as the basic mode for Recipe.
The feature module Cost will be available soon.

PALAMAX.MAINTAIN

Enables the implementation of preventive maintenance

- Enables planning of production downtimes in a deterministic manner
- Supports more efficient maintenance planning
- Saves maintenance costs due to the precise determination of the actual need

PALAMAX.RECIPE

Enables production engineering to prepare & test a repeatable factory set-up.
Factories can switch between products within minutes.

- Reduction of setup times of products on the shop floor
- Ensure repeatability of production with qualified qualities
- Enables more comprehensive & specific production

PALAMAX.TRACK&TRACE

The PALAMAX.Track&Trace module allows tracing of a product throughout its production cycle by processing the associated data flows and creating a logical and chronological connection between them. It helps support sustainability, accountability and compliance goals by creating a transparent history of the inputs and production conditions of each produced unit.

- Filtering of units and groups based on lot, ids, process conditions and more
- Improvement of Q&A and compliance efforts
- Creation of data basis for machine learning / AI applications

PALAMAX.COST

Increases effectiveness & efficiency so that production becomes more profitable

- Easier comparison of different production routes for the same product
- Tighter cost control
- More profitable production

PALAMAX.CLOUD

Allows you to run your MB PALAMAX® system in the cloud

- Cloud-agnostic architecture
- Works with all major cloud providers (AWS, Azure, Google Cloud)
- Decreased reliance on on-site hardware

PALAMAX.SELF-MONITORING

Enables MB PALAMAX® to monitor its own status

- Real-time information on MB PALAMAX® system health
- Quickly recognize issues and resolve in your MB PALAMAX®
- Facilitates diagnosis and support

PALAMAX.AUDIT

Unlocks audits of individual manufacturing runs

- Check compliance of production
- Uncover deviations
- Compare different runs

Mühlbauer
High Tech International

MÜHLBAUER GERMANY

Mühlbauer Group Headquarters
Josef-Mühlbauer-Platz 1, 93426 Roding, Germany
Phone: +49 9461 952 0, Fax: +49 9461 952 1101
info@muehlbauer.de, www.muehlbauer.de

MÜHLBAUER USA

Muhlbauer Inc.
226 Pickett's Line
Newport News, VA 23603-1366, USA
Phone: +1 757 947 2820, Fax: +1 757 947 2930
info@muhlbauer.com, www.muhlbauer.com

MÜHLBAUER MALAYSIA

MB Automation (Malaysia) Sdn. Bhd.
No. 3 Jalan TU 62, Taman Tasik Utama,
75450 Melaka, Malaysia
Phone: +60 6 275 7100, Fax: +60 6 275 7101
info@muehlbauer.com.my, www.muehlbauer.com.my

MÜHLBAUER SERBIA

Mühlbauer Technologies d.o.o.
Evropska 17, 22300 Stara Pazova, Serbia
Phone: +381 22 215 5100, Fax: +381 22 215 5130
serbia@muehlbauer.de, www.muhlbauer.com

MÜHLBAUER CHINA

Muehlbauer Technologies (Wuxi) Co., Ltd.
No 23. Huayi Road, Wuxi New District
214135 Wuxi, Jiangsu, China
Phone: +86 510 8190 0100, Fax: +86 510 8190 0101
info@muehlbauer.cn, www.muehlbauer.cn

MÜHLBAUER SLOVAKIA

Muehlbauer Technologies s.r.o.
Novozámocká 233, 94905 Nitra, Slovakia
Phone: +421 37 6946 000, Fax: +421 37 6946 501
info@muehlbauer.sk, www.muehlbauer.sk



MB Automation GmbH & Co. KG
Josef-Mühlbauer-Platz 1 | 93426 Roding | Germany
Tel.: +49 9461 952 0 | Fax: +49 9461 952 1101
Mail: info@muehlbauer.de | Web: www.muehlbauer.de

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